Brett's Recommended Readings – February 2002

Reeves, G.H., L.E. Benda, K.M. Burnett, P.A. Bisson, and J.R. Sedell. 1995. A disturbance-based ecosystem approach to maintaining and restoring freshwater habitats of evolutionarily significant units of anadromous salmonids in the Pacific Northwest. American Fisheries Society Symposium 17:334-349.
-- A great paper for starting to put disturbance into context within both planning and environmental documents.

Abstract – To preserve and recover evolutionarily significant units (ESUs) of anadromous salmonids *Oncorhynchus* spp in the Pacific Northwest, long-term and short-term ecological processes that create and maintain freshwater habitats must be restored and protected. Aquatic ecosystems throughout the region are dynamic in space and time, and lack of consideration of their dynamic aspects has limited the effectiveness of habitat restoration programs. Riverine-riparian ecosystems used by anadromous salmonids were naturally subjected to periodic catastrophic disturbances after which they moved through a series of recovery states over periods of decades to centuries. Consequently the landscape was a mosaic of varying habitat conditions, some that were suitable for anadromous salmonids and some that were not. Life history adaptations of salmon, such as straying of adults, movement of juveniles, and high fecundity rates, allowed populations of anadromous salmonids to persist in this dynamic environment. Perspectives gained from natural cycles of disturbance and recovery of the aquatic environment must be incorporated into recovery plans for freshwater habitat. In general, we do not advocate returning to the natural disturbance regime, which may include large-scale catastrophic processes such as stand-replacing wildfires. This may be an impossibility given patterns of human development in the region. We believe that it is more prudent to modify human-imposed disturbance regimes to create and maintain the necessary range of habitat conditions in space (10^3 km) and time (10^1-10^2 years) within and among watersheds across the distributional range of an ESU. An additional component of and recovery plan, which is imperative in the short-term, is the establishment of watershed reserves that contain the nest existing habitats and include the most ecologically intact watersheds.

Rieman, B.R., D.C. Lee, R.F. Thurow, P.F. Hessburg, and J.R. Sedell. 2000. Toward an integrated classification of ecosystems: defining opportunities for managing fish and forest health. Environmental Management 25:425-444.
-- A possible approach to include in both Sub-basin planning and watershed analysis. Could be useful in prioritizing both terrestrial and aquatic restoration/management projects.

Many of the aquatic and terrestrial ecosystems of the Pacific Northwest United States have been simplified and degraded in part through past land-management activities. Recent listings of fishes under the Endangered Species Act and major new initiatives for the restoration of forest health have precipitated contentious debate among manages and conservation interests in the region. Because aggressive management activities proposed for forest restoration may directly affect watershed processes and functions, the goals of aquatic and terrestrial conservation and restoration are generally viewed as in conflict. The inextricable links in ecological processes and functions, however, suggest the two perspectives should really represent elements of the same problem; that of conserving and

restoring more functional landscapes. We use recent information on the status and distribution of forest and fish communities to classify river subbasins across the region and explore the potential conflict and opportunity for a more integrated view of management. Our classification indicated that there are often common trends in terrestrial and aquatic communities that highlight areas of potential convergence on management goals. Regions where patterns diverge may emphasize the need for particular care and investment in detailed risk analysis. Our spatially explicit classification of subbasin conditions provides a mechanism for progress in three areas that we think is necessary for a more integrated approach to management: (1) communication among disciplines; (2) effective prioritization of limited conservations and restoration resources; and (3) a framework for experimentation and demonstration of commitment and untested restoration techniques.

Montgomery, D.R. and J.M. Buffington. 1997. Channel-reach morphology in mountain drainage basins. Geological Society of America Bulletin 109:596-611.
-- Good overview paper. May be very helpful in explaining effect on disturbance on different channel types. A contrast to the Rosgen channel classification system

A classification of channel-reach morphology in mountain drainage basins synthesizes stream morphologies into seven distinct reach types: colluvial, bedrock, and five alluvial channel types (cascade, step pool, plane bed, pool riffle, and dune riffle). Coupling reach-level channel processes with the spatial arrangement of reach morphologies, their links to hillslope processes, and external forcing by confinement, riparian vegetation, and woody debris defines a process-based framework within which to assess channel condition and response potential in mountain drainage basins. Field investigations demonstrate characteristic slope, grain size, shear stress, and roughness ranges for different reach types, observations consistent with our hypothesis that alluvial channel morphologies reflect specific roughness configurations adjusted to the relative magnitudes of sediment supply and transport capacity. Steep alluvial channels (cascade and step pool) have high ratios of transport capacity to sediment supply and are resilient to changes in discharge and sediment supply, whereas low gradient alluvial channels (pool riffle and dune ripple) have lower transport capacity to supply portions and thus exhibit significant and prolonged response to changes in sediment supply and discharge. General differences in the ratio of transport capacity to supply between channel types allow aggregation of reaches into source, transport, and response segments, the spatial distribution of which provides a watershed-level conceptual model linking reach morphology and channel processes. These two scales of channel network classification define a framework within which to investigate spatial and temporal patterns of channel response in mountain drainage basins.

Benda, L. and T. Dunne. 1997. Stochastic forcing of sediment routing and storage in channel networks. Water Resources Research 33:2865-2880.
-- Explains how sediment in routed during stream channels of difference sizes. Could help explain/predict natural disturbance rates and changes in particle size within a basin.

The stochastic field of sediment supply to the channel network of a drainage basin depends on the large-scale interactions among climatically driven processes such as forest fire and rainstorms, topography, channel network, topology, and basin scale. During infrequent periods of intense erosion, large volumes of colluvium are

concentrated in parts of a channel network. As the concentrations of bed material migrate along the network their waveforms can undergo changes by diffusion, interference at tributary junctions, and loss of mass through temporary sediment storage in fans and terraces and through particle abrasion, which converts bed material to wash load. We investigates how these processes might influence the sediment mass balance in channels of third and higher order in a 215-km2 drainage basin within the Oregon Coast Range over a simulated 3000-year period with a simulation model to illustrate interactions between the major controls on large0scale processes functioning over long periods of time in complex drainage basins.